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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/712,729	11/12/2003	David Charles Pender	128518-1	9280

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GENERAL ELECTRIC COMPANY
GLOBAL RESEARCH
PATENT DOCKET RM. BLDG. K1-4A59
NISKAYUNA, NY 12309

EXAMINER
DEHGHAN, QUEENIE S

ART UNIT	PAPER NUMBER
1731	

DATE MAILED: 05/09/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	Application No.	Applicant(s)
	10/712,729	PENDER ET AL.
	Examiner	Art Unit
	Queenie Dehghan	1731

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 March 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 November 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities:

   a. The following items are not labeled in the figures

      i. [0034], line 4 “a cylindrical wall 212”

      ii. [0034], line 6 “outer diameter 216”

      iii. [0034], line 6 “annular space 218”

      iv. [0037], line 2, outer surface 215”

   Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-8,10, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miller (5,076,824) in view of Monberg et al. (6,550,280), Yokokawa (5,785,729), Lum et al. 96,732,549), O'Brien, Jr. (4,276,072), Kyoto et al. (4,969,941), and Yokokawa (5,769,921). Miller discloses a system for sintering a hollow cylinder of soot while supported on a cylindrical mandrel (col. 2 lines 5-7) and a retaining portion (25) coupled to one end of the mandrel (Fig. 2). Miller also discloses in figure 2, a heating zone of the furnace where the soot cylinder is sintered at a temperature of 1400°-1500°C (col. 5 lines 41-42) in a controlled atmosphere (col. 3 lines 48-52). Miller

further shows the mandrel disposed in the annular space of the cylinder in Fig. 2 and mentions a central portion of mandrel that is coated (col. 4 lines 60-62). However, Miller does not state specific characteristics of the mandrel or a means for position the mandrel and soot cylinder within the heating zone.

a. Regarding claims 1 and 2, Monberg also discloses a system for sintering silica overcladding tube (quartz tube) in a hot zone of a furnace at a temperature of 1500°C (col. 4 lines 3-5), where the quartz tube is further use in the making of an optical fiber perform (col. 1 27-35). Monberg illustrates in Figure 2, a handle assembly (40, 22, and 10) that serves as a means for position a quartz tube (10) within a heating zone (42). Furthermore, Monberg discloses the importance of achieving a bow of 0.3mm/m (col. 2 lines 40-41) in the sintering of quartz tube in order to prevent interference with the core rod insertion and poor properties of the optical fiber drawn from the perform made with the tube (col. 2, lines 31-36). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the bow requirement of 0.3mm/m, as described by Monberg, in the central portion of the mandrel/support rod of Miller in order to achieve a bow of 0.3mm/m in the sintered quartz tube of Miller and prevent interference in the core rod insertion of the tube. Additionally, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the handle describe by Monberg in Miller's sintering process in order to facilitate the positioning of the support rod and quartz tube within the heating zone.

b. Yokokawa (729) discloses a system for manufacturing a quartz tube (col. 7 lines 48-62) to be used in a rod-in-tube technique for fiber optic preforms, where the

inner surface of the tube is controlled to a roughness of 20µm or less (col. 8 lines 42-45). In example 4, Yokokawa produces a vitrified quartz tube (col. 14 lines 34-35), with a surface roughness of 3.5µm (col. 14 lines 59-60). Yokokawa further discuss the importance of achieving such a surface roughness on the inner surface of the quartz tube, especially when used in a rod-in-tube process for manufacturing optical fiber performs (col.2 lines 59-67). In addition, Yokokawa discloses a cylindrical quartz tube with high circularity at any position along its longitudinal direction. It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a surface roughness of 3.5µm, as disclosed by Yokokawa, in the central portion of the mandrel/support rod of Miller in order to achieve a surface roughness of 3.5µm on the inner surface of the sintered quartz tube of Miller and to prevent the generation of bubbles and inclusion of impurities.

c. Regarding claims 1 and 2, Lum discloses a sintering process for producing a glass overcladding tube (quartz tube) by passing through the hot zone of a furnace in the Abstract. Lum further discloses a sintering process that produces quartz tubes with low ovalities (col. 7 lines 38-39), such as 100µm (col. 7 lines 41-44), along the longitudinal axis of the tube. It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize an ovality of 100µm, as disclosed by Lum, in the central portion of the mandrel/support rod of Miller in order to achieve an ovality of 100µm on the inner surface of the sintered quartz tube of Miller and to promote more uniform core-cladding outer diameters in the fibers.

d. O'Brien, Jr. discloses a tubular substrate (mandrel) used in the vapor deposition of silica glass particles (col. 1 lines 26-28), where the mandrel is of graphite material (col. 1 line 45) and has a thermal expansion much larger than that of fused silica (col. 6 lines 57-59). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a graphite carbon mandrel with a thermal expansion greater than fused silica, as described by O'Brien, Jr., in Miller's process in order to help facilitate the easy removal of the mandrel after use.

e. Regarding claims 1 and 20, Kyoto discloses a furnace for heating a perform made of particles of quartz base glass to a temperature of at least 1400°C in an inert atmosphere (col. 1 lines 28-31), comprising of inert gas, such as helium, and chlorine-containing gas or fluorine-containing gas (col. 1 lines 47-48). Kyoto further mentions that carbon is a material that is substantially inert with chlorine- or fluorine-containing gas with respect to silica (col. 5 lines 26-30). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the graphite carbon mandrel as describe by O'Brien, Jr., since it is substantially inert with respect to silica in an atmosphere comprising of inert gas and chlorine-containing gas or fluorine-containing gas, as describe by Kyoto, in sintering process described by Miller in order to prevent contamination of the quart tube.

f. It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the handle for positioning and bow requirement of Monberg, the surface roughness of Yokokawa, the ovality requirement of Lum, and the thermal expansion material of O'Brien, Jr., which is chemically inert with silica as

described by Kyoto, in the furnace of Miller for sintering a quartz tube in a controlled environment at a temperature of at least 1400°C in order to manufacture a quartz tube that meets the stringent requirement for making a perform for optical fiber, from which optical fibers with the desired core/clad concentricity is drawn.

4. Regarding claims 3-7, Miller further discloses a mandrel that is preferably of the carbonaceous material, graphite (col. 4, lines 67-68), where a central portion of the mandrel is coated with boron nitride (col. 4 lines 60-64). However, Miller does not disclose the ash content of the graphite or purifying the graphite. Kyoto discloses the use of a carbon that has ash content less than 100ppm (col. 7 lines 40-41) and that has been purified in the presence of a chlorine gas (col. 15 lines 5-8). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a graphite carbon material that has less than 100ppm ash content and that has been purified in chlorine gas, as presented by Kyoto, in the boron nitride coated mandrel of Miller's sintering process in order to minimize impurities such as iron and copper in the mandrel and to remove moisture in the mandrel as well.

5. Regarding claim 8 and 10, Miller discloses the use of a mandrel made of aluminum oxide (col. 5 lines 61-63) as well. In addition, Miller recites the process of coating of a solid substrate mandrel with coating material comprising of graphite and boron nitride by chemical vapor deposition (col. 6 lines 47-52). Although coating a graphite mandrel is preferred, it is not limited (col. 4, lines 60-68). It would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the

boron nitride or graphite coating on the aluminum oxide mandrel in order to protect the mandrel from corrosive effects of reactive gases in the furnace.

6. Claims 9-12 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miller in view of Monberg et al. (6,550,280), Yokokawa (5,785,729), Lum et al. 96,732,549), O'Brien, Jr. (4,276,072), and Kyoto et al. (4,969,941), as applied to claim 1 above, and in further view of Yokokawa (5,769,921). Miller discloses a sintering system comprising of a furnace and a mandrel or support rod assembly with a central portion. Miller does not mention the central portion of the mandrel as being tubular in structure or the dimensions of the rod. In the Abstract, Yokokawa (921) discloses a process for manufacturing and sintering a quartz tube (col. 3 lines 48-51) for use as a perform for optical fibers (col. 1 lines 5-7), where a solid or hollow cylindrical support rod with an outer diameter between 15mm to 50mm and a length between 750mm and 1500mm is used to support the glass body in a sintering furnace. It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize this tubular structure with a outer diameter of 20mm, for example, and a length of 1000mm, for example, as mentioned by Yokokawa, in the sintering process of Miller to allow for larger glass bodies and various glass bodies to be made, such as quartz fiber optic tubes or core rods.

7. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miller in view of Monberg et al. (6,550,280), Yokokawa (5,785,729), Lum et al. 96,732,549), O'Brien, Jr. (4,276,072), and Kyoto et al. (4,969,941), as applied to claim 1 above, and in further view of Ruppert (5,738,702) and Baniel (5,618,325). Miller discloses the use

of mandrel in the sintering of a soot cylinder in a furnace. Miller does not mention the distance between the mandrel and the soot cylinder. Ruppert teaches of another support structure used in the sintering (col.1 lines 9-13) of a hollow soot cylinder or a quartz tube (col. 5 lines 32-33), where the hollow cylinder collapses onto the support assembly with the result that the internal diameter of the collapsed tube will be determined by the outer diameter of support element (col.4 lines 45-50). Furthermore, Baniel provides an example of collapsing a glass tube onto a rod by utilizing a rod-in-tube technique (col. 7 lines 45-47), where the outer diameter of the rod is 10.00mm and the inner diameter of the surrounding tube is 10.05mm (col. 7 lines 37-40), leaving a difference less than 0.1mm between the two diameters. It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize Ruppert's teaching of how quartz tubes take on the diameter of outside diameter of the inside rods and minimizing the difference between the diameter to less than 0.1mm, such as demonstrated by Baniel, in Miller's sintering assembly in order to allow for a perfect fit and minimize bubble formation between the tube and the rod during sintering.

8. Claims 14-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miller in view of Monberg et al. (6,550,280), Yokokawa (5,785,729), Lum et al. 96,732,549), O'Brien, Jr. (4,276,072), and Kyoto et al. (4,969,941), as applied to claim 1 above, and in further view of Ruppert (5,738,702). Miller discloses a system for sintering a hollow cylinder of soot while supported on a cylindrical mandrel (col. 2 lines 5-7) and a retaining portion (25) coupled to one end of the mandrel (Fig. 2). However, Miller does not disclose a coupling in the retaining portion or a second retaining portion.

Ruppert teaches of another support structure used in the sintering (col.1 lines 9-13) of a hollow soot cylinder or a quartz tube (col. 5 lines 32-33), where the support structure is has two retaining portions. Ruppert further describes one retaining portion as a hanging element comprising of a retaining ring (col. 4 lines 27-28), which serves to couple the top end of the quartz tube and support rod and a second retaining portion that is a base which is affixed (col. 7 lines 64-67) to a lower end of the support rod and is distal to the coupling (col. 4 lines 1-4). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the two retaining portions and as disclosed by Ruppert in Miller's sintering system in order to provide ample support for sintering of large soot bodies or quartz tubes and prevent deformations associated with the softened glass due to its weight.

9. Claims 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miller in view of Monberg et al. (6,550,280), Yokokawa (5,785,729), Lum et al. 96,732,549), O'Brien, Jr. (4,276,072), and Kyoto et al. (4,969,941), as applied to claim 1 above, and in further view of Lane et al. (4,741,748). Miller discloses a system for sintering a hollow cylinder of soot while supported on a cylindrical mandrel (col. 2 lines 5-7). Monberg illustrates in Figure 2, a handle assembly (40, 22, and 10) that serves as mean for position a quartz tube (10) within a heating zone (42). Monberg further mentions the handle assembly is tubular or rod shape and has a section form from silica (col. 3 lines 29-31) and is coupled to an external support, such as a universal joint (col. 3 lines 55-58). However, neither Monberg nor Miller recites a drive system for moving either the rod or the furnace. Lane illustrates in Fig. 3 a drive system coupled to a rod,

which serves to move a quartz tube and support rod assembly through a furnace for sintering (col. 4 lines 24-25). Furthermore, Lane illustrates in Fig. 3 a drive mechanism coupled to a furnace (38), which serves to move the furnace along the longitudinal axis of the tube (col. 5 lines 49-51). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the quartz rod coupled to an external support, as described by Monberg and the drive system for moving the quartz tube and/or the furnace along the axis of the rod, as described by Lane in Miller's sintering process in order to position the quartz tube within the hot zone of the furnace.

Response to Arguments

10. Applicant's arguments filed March 29, 2006 have been fully considered but they are not persuasive. Although a support rod with the claim characteristics were not specifically presented, the support rod of Miller is in contact with the quartz tube to be sintered and in order to impart the claimed characteristics that the prior art teaches on the sintered quartz tube, it would be obvious to expect the same characteristics on the support rod contacting the quartz tube. Furthermore, the mandrel is removed after the soot cylinder is consolidated which the support rod has provided support for while consolidating (col. 3 lines 64-66). Regarding Yokokawa teaching away from ovality towards circularity, the applicant claimed an ovality of *up to* 0.5mm, indicating that minimum ovality is desired, such as circularity (or zero ovality). Regarding the motivations given for reactivity in an inert environment, the applicant claims a support rod that is inert with the environment and the prior art presented teaches that graphite is such a material of choice. In a different embodiment when the applicant changes the

material of choice to alumina, the rod is no longer chemically inert with the environment, hence the need for the protective coating, as taught by the prior art. Regarding claim 13, the particular support rod presented by Ruppert et al. is utilized to help remove bubble formations as described in col. 6 lines 20-24 and the particular diameters presented by Baniel is used to achieve a perfection of fit, as described in col. 7 lines 47-49. The art teaches the claimed diameter differences. Regarding claims 14 and 15, the retaining portions of Ruppert et al. offer support to the sintering soot from the top and bottom of the soot body and also assist in preventing deformations associated with the weight of the glass in the vertical direction. However, the retaining portions do not cover the entire length of the annular space of the quartz tube. Therefore the support rod of Miller will be necessary for supporting the central sections of the quartz tube.

11. In response to applicant's argument that the examiner has combined an excessive number of references, reliance on a large number of references in a rejection does not, without more, weigh against the obviousness of the claimed invention. See *In re Gorman*, 933 F.2d 982, 18 USPQ2d 1885 (Fed. Cir. 1991).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Queenie Dehghan whose telephone number is (571)272-8209. The examiner can normally be reached on Monday through Friday 8:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Griffin can be reached on 571-272-1189. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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